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REPORT ON THE SEVENTH UNITED NATIONS INTERNATIONAL TRAINING COURSE ON REMOTE SENSING EDUCATION FOR EDUCATORS

(Stockholm and Kiruna, Sweden, 5 May to 13 June 1997)

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INTRODUCTION

A. Background and objectives

1. The Seventh United Nations International Training Course on Remote Sensing Education for Educators, held at Stockholm and Kiruna, Sweden, from 5 May to 13 June 1997, was organized by the United Nations Programme on Space Application in cooperation with the Government of Sweden. The course was conducted specifically for the benefit of educators from developing countries with the objective of enabling them to introduce remote sensing courses in their respective academic institutions. It was co-sponsored by the Swedish International Development Agency (SIDA) on behalf of the Government of Sweden and was hosted by the

Department of Physical Geography of Stockholm University, at Stockholm, and the Swedish Space Corporation (SSC Satellitbild).

2. The present report describes the organization of the training course, its technical contents, the results of the course evaluation and the proposed follow-up actions. It has been prepared for the Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcommittee.

B. Organization and programme

3. Application forms and information brochures on the training course were sent out in November 1996 by the Office for Outer Space Affairs of the United Nations to offices of the United Nations Development Programme for transmission to the relevant national authorities in 48 developing countries. The same material was also distributed simultaneously to relevant Swedish embassies and to previous course participants for circulation in their academic institutions. Eighty-seven completed applications were subsequently received and jointly processed by the United Nations Office for Outer Space Affairs and Stockholm University. The selection of participants was completed by the end of February 1997, approximately two months before the start of the course.

4. Twenty-seven candidates, including nine women, were selected as participants. The participants were nationals of the following 20 countries: Bolivia, Brazil, Cambodia, Costa Rica, Haiti, Kenya, Lao People's Democratic Republic, Lesotho, Mozambique, Myanmar, Nepal, Nicaragua, Pakistan, Paraguay, Sri Lanka, Thailand, Uganda, United Republic of Tanzania, Zambia and Zimbabwe. Funds for the international travel of 13 participants were provided from the fellowship budget of the United Nations Programme on Space Applications. All other support, including international travel of the remaining 14 participants, room and board, course materials, and inland transport for all 27 participants, was provided by the Government of Sweden.

5. Course instructors and speakers came from several institutions, including the Office for Outer Space Affairs, European Space Agency (ESA), SIDA, Stockholm University, Royal College of Technology, Uppsala University, Swedish Royal Institute of Technology, Swedish National Space Board, Swedish Society for Nature Conservation and SSC Satellitbild.

I. SUMMARY OF THE CONTENTS OF THE COURSE

6. The technical contents of the course were determined by the Department of Physical Geography of Stockholm University, with input from the Office for Outer Space Affairs. The course was modular in format and consisted of a series of lectures and office and field exercises. A more detailed summary of the contents of the course can be found in the report on the fifth course in the series (A/AC.105/617).

7. The first technical module of the course lasted three days and dealt with the fundamental principles of remote sensing. The principal topics covered were the following: electromagnetic radiation, the reflective properties of various types of materials on the surface of the Earth, and elementary optics; electronic imaging; georeferencing of objects in the field, on maps and on satellite imagery; and Earth resources and environmental satellites.

8. Five days were subsequently devoted to image interpretation and presentations on the following subjects: remote sensing for land-use planning and environmental monitoring; remote sensing for geological studies; introduction to visual interpretation and in-service training in developing countries.

9. To reinforce understanding of the principles of image interpretation, participants were divided on a regional basis into groups, each of which studied a case history where visual interpretation of satellite images played a key role. The case histories were: land and water development in Ethiopia; land-use mapping in the United Republic of Tanzania; forestry in Ecuador; geological applications in Central America; environmental impact assessment of the closure of a river arm in Bangladesh; and environmental impact assessment of hydropower development in the Lao People's Democratic Republic. Participants made presentations on the state of development of remote sensing in their respective countries.

10. An additional series of lectures dealt with digital image analysis and geographic information systems (GIS). This section lasted six days and covered the following subjects: digital analysis (theory); computer image enhancement (theory); GIS theory; and digital image processing techniques, including computer-aided analysis, GIS applications, CD-ROM, data capture, compass techniques and global positioning systems.

11. The participants were also introduced, over a period of three days, to the principles of radar image formation and the use of such images in various development and research applications. In addition, they were introduced to the use of appropriate procedures for the field verification of interpretations of remotely sensed data using satellite images of the Skinnskatteberg area of southern Sweden.

12. The succeeding part of the course was held at Kiruna, at the facilities of SSC Satellitbild. Four days were reserved for visual interpretation exercises and the presentation of results. Wherever possible, the exercises were carried out on images selected by the participants of regions of their countries with which they were familiar. Lectures were presented on the following subjects: archiving, catalogue updating and standard production of images; image processing, value-added production, radiometric and geometric corrections, and production of digital elevation models and orthoimages; computerized cartography; standard and higher level processed imagery; and future Earth-resources satellites.

13. During this part of the course, the representative of the United Nations made a presentation entitled "Tele-education for development: a priority theme of the COPINE project". While at Kiruna, the participants had the opportunity to visit a number of sites of interest, including the ESA/Salmijarvi and Esrange satellite receiving stations, and the Kirunavaara underground mine. Lectures were supplemented by tours of the production facilities of SSC Satellitbild.

14. The final part of the course concerned the development of remote sensing curricula, and was held over a period of one and one-half days at the Department of Physical Geography of Stockholm University. It was followed by a half-day session reserved for formal evaluation of the course.

II. COURSE EVALUATION

15. Participants made a formal presentation of the course evaluation to representatives from the Office for Outer Space Affairs, SIDA, the Department of Geography of Stockholm University and several selected course lecturers. Additional input was provided by all participants in discussions following the formal presentation.

16. The participants' opinions extracted from 26 completed questionnaires can be summarized as follows: (a) 73 per cent thought the course was right in length; (b) 38 per cent found the schedule too heavy; (c) 65 per cent found that the theoretical training corresponded to their professional needs to a large or very large extent whereas 50 per cent found that to be the case for the practical training; (d) 88 per cent found the overall level of the programme to be adequate from their personal professional point of view; (e) 77 per cent found that there were subjects not adequately covered in the programme; (f) 81 per cent found the methods of instruction to be

good or very good; and (g) 77 per cent thought that they would have an opportunity to apply the newly acquired knowledge and experience in their current employment to a great or very great extent.

III. PROPOSED FOLLOW-UP ACTIONS

17. A proposal to organize a workshop in 1998 focusing on a technical evaluation of the present course and determining its future direction was developed jointly by Stockholm University and the Office for Outer Space Affairs. The experiences of past participants subsequent to their attending the course would be a major input to the final outcome of the workshop. The proposal would be submitted in the last quarter of 1997 to SIDA for funding consideration.